

DRAFT

**WORK PLAN FOR
USE AND ATTAINABILITY ANALYSIS OF
COFFEE CREEK AND MOSSY LAKE**

Prepared for:
Georgia-Pacific – Crossett Paper Operations

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And

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June 15, 2011

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SECTION 1

INTRODUCTION

1.1 PURPOSE OF STUDY

The purpose of this investigation is to determine if the current designated use for Coffee Creek and Mossy Lake is appropriate and if any revisions to the designated use for these water bodies should be made. Both water bodies are located within the Ouachita River Basin. The study area consists of:

1. Coffee Creek upstream from its confluence with the Georgia-Pacific LLC (Georgia-Pacific) treated effluent;
2. Indian Creek;
3. Mossy Lake;
4. an unnamed Felsenthal Wildlife Management Area Reference Stream; and
5. Wildcat Lake.

If Wildcat Lake cannot be accessed, either Pete Wilson Lake or Grand Marais Lake in the Felsenthal Wildlife Management Area will be used. The unnamed Felsenthal Wildlife Management Area Reference Stream is similar to the upstream physical and ecological attributes of Coffee Creek and will be used as a Reference stream to compare the water quality conditions of Coffee Creek and Indian Creek. Wildcat Lake (or an alternate lake) will be used as a reference lake to Mossy Lake. The area of investigation is located in southern Arkansas, as shown in Figure 1. The proposed sampling stations are presented in Figure 2. The purpose of this study does not include the analysis of water quality conditions in the Ouachita River.

The United States Environmental Protection Agency (USEPA), Region 6 published, through its contractor, Parsons, the *Use Attainability Analysis and Water Quality Assessment of Coffee Creek, Mossy Lake, and the Ouachita River* in December 2007. **AquAeTer, Inc. (AquAeTer)** reviewed this document and found that there are limited available data in regards to water quality, habitat assessment, and biological analyses. In response to the review, an additional study is needed to address the data gaps and to assess the appropriate designated use of and use variation applicable to Coffee Creek and Mossy Lake, specifically comparing Coffee Creek and Mossy Lake with true reference locations.

Given the need for additional data, Georgia-Pacific has contracted **AquAeTer** to develop a Use Attainability Analysis (UAA) of Coffee Creek and Mossy Lake. This study will include

conducting field assessments of relevant habitats, collecting and analyzing macroinvertebrate and fish species, obtaining water quality data, and assessing seasonal hydrologic conditions in these water bodies. The data will be collected at six sites on Coffee Creek and Mossy Lake, a site on Wildcat Lake (or an alternate lake), and a site at an unnamed reference stream in Felsenthal Wildlife Management Area. All of the tasks of this study will be performed under this single Work Plan.

1.2 DESCRIPTION OF WATER BODIES

This study is to determine if the current designated use and use variation for Coffee Creek and Mossy Lake are appropriate and if any revisions to the designated use for these water bodies should be made. This study is not designed to include the Ouachita River. However, it is important to describe the Ouachita River when discussing Coffee Creek and Mossy Lake. Annual flooding of the Ouachita River inundates portions of Coffee Creek and Mossy Lake. At these times, these streams are a part of the Ouachita River. This study will not attempt to complete sampling of these sites when the Ouachita River has inundated any of the selected stations.

The headwaters of the Ouachita River are in the Ouachita Mountains near Eagleton, in western Arkansas. The water flows southeast to form Lake Ouachita near Hot Springs, Arkansas. The River then continues south through a series of lakes, including Felsenthal Reservoir, approximately 6-miles upstream from the Arkansas-Louisiana border. The Ouachita River then flows through northeast Louisiana and joins the Tensas River to form the Black River. The Black River and the Red River merge to form the Atchafalaya River.

A chain of locks and dams on the river was initiated by the Vicksburg District, U.S. Army Corps of Engineers in the 1960s with the objective being to link the ports along the Ouachita River to the Gulf of Mexico. This was achieved in 1984 with completion of the H. K. Thatcher and Felsenthal locks and dams in southern Arkansas. These locks, along with Columbia and Jonesville locks in Louisiana, now provide year-round 9-foot navigation to Camden, Arkansas. The 6 miles of the Ouachita River between Felsenthal Dam and the state line has a slight gradient (<0.5 feet/mile), steep cut sandy banks, deep channel, no riffle areas, a heavy sediment load, and a bottom characterized as shifting sand and silt (LORWG 1993).

A site reconnaissance was performed on March 31, 2011 and April 1, 2011 to determine site selection for the UAA activities. The Arkansas Department of Environmental Quality (ADEQ), Georgia-Pacific Crossett (Georgia-Pacific or GP), and **AquaEter** conducted the reconnaissance. USEPA was unable to attend.

1.2.1 Description of the Coffee Creek and Mossy Lake System

1.2.1.1 Coffee Creek

Coffee Creek begins in the City of Crossett and effectively begins at Lucas Pond at a City Park, as shown on the USGS topographic map in Figure 3. Coffee Creek at this point is an upland creek with significant semi-urban influence and is not inundated by the yearly floods on the Ouachita River. Coffee Creek then proceeds in a southeasterly direction around the City of Crossett Facultative Wastewater Treatment Pond, then onto the Georgia-Pacific property near the Aerated Stabilization Basin (ASB), and then heads in a southerly direction to the east of the ASB effluent canal until a point about 0.8 mile upstream from Mossy Lake where it commingles with the Georgia-Pacific effluent canal and enters Mossy Lake. Coffee Creek travels through Mossy Lake. It continues from the outfall of Mossy Lake through a dug channel for approximately 0.59 mile to the Ouachita River at about Ouachita River Mile (ORM) 221.9. The old Coffee Creek channel enters the Ouachita River at ORM 222, but no longer connects to the upper basin draining into Mossy Lake.

During the historical highest recorded flood event, the Ouachita River extended to the Georgia-Pacific ASB dikes. Yearly flooding can inundate large portions of Coffee Creek.

Historically, the Georgia-Pacific effluent traveled down Coffee Creek from the Mill to treatment in Mossy Lake. Below is a brief summary of the historical use of Coffee Creek and Mossy Lake and the man-made changes made to the system.

- | | |
|-----------|--|
| 1937 | Discharge gates and levees installed to expand Mossy Lake holding/treatment capacity from 20 acres to 600 acres. |
| Mid-1950s | Stabilization basin was installed on Coffee Creek. |
| 1970 | New channel installed between the stabilization basin and Mossy Lake. |

1.2.1.2 Mossy Lake

Mossy Lake was apparently an old oxbow of the Ouachita River and is currently about 584 acres in size, although its size can fluctuate depending on hydrological conditions. The water depths in Mossy Lake range from about 10 ft at the present day Georgia-Pacific Outfall SMS-002 structure to 1 to 2 ft of depth for the most part of the Lake. Georgia-Pacific currently maintains Mossy Lake with a dike and the Outfall SMS-002 structure.

Georgia-Pacific first utilized Mossy Lake for effluent treatment in the late 1930's prior to any regulatory standards on the Ouachita or technology standards requiring treatment. A weir was located in Coffee Creek about 0.25-mile downstream from the current Outfall SMS-002 structure and portions of the structure still exist today. The effluent 5-day biochemical oxygen

demand (BOD₅) discharged from the ASB at Outfall 001 undergoes further degradation in Mossy Lake and the effluent BOD₅ concentrations and loadings are reduced about 50% in Mossy Lake. This additional removal allows the more stringent effluent standards to be met in the Ouachita River during the critical conditions in the summer months.

1.2.2 Felsenthal Reservoir and Forested Wetlands Areas

The Felsenthal Reservoir was constructed to provide natural forested wetlands primarily for hunting. Felsenthal Dam located at approximately ORM 227 is designed to go free-flow at water surface elevations of greater than 65 ft NGVD. The areas in the Felsenthal forested lands are inundated as well, similar to the Coffee Creek and Mossy Lake area during these flood events. The streams in the forested wetlands of the Felsenthal Wildlife Management Area are very similar in appearance to Coffee Creek and drain similar areas of forested wetlands and swamps.

1.3 Recommended UAA Sampling Sites

Based on the reconnaissance of the area, Coffee Creek, Mossy Lake, Felsenthal Wildlife Management Area streams, Felsenthal Wildlife Management Area lakes, and the original Parsons stations (Parsons and U. of Arkansas December 2007), eight sampling sites have been selected for the UAA study. The intent of the UAA is to select representative stream and lake sites that represent Coffee Creek in its natural form and compare these sites with a reference stream site in Felsenthal Wildlife Management Area that is similar in drainage and in its yearly inundation by the Ouachita River.

Mossy Lake is influenced by Georgia-Pacific in that flow in this system during dry periods comes almost exclusively from the Georgia-Pacific effluent. This Lake also exists in its current areal extent and depths due to the outfall structure maintained by Georgia-Pacific. Although not truly a natural swamp lake or bog, it will be compared with a similar type lake-like area off the Ouachita River in the Felsenthal Reservoir called Wildcat Lake. Mossy Lake has been used since the late 1930's under its current use. The Wildcat Lake area to be used as a reference lake was created when the Felsenthal Dam was completed in 1984 and it is continuously under some influence of the Ouachita River. Although these two lakes have different flow profiles, they are similar in visual appearance. Both have cypress trees and other wetlands trees within the wet areas of the lake. Both are inundated by the Ouachita River on an almost yearly basis. They both receive tributary inflows from forested wetland areas. The major difference between the two lakes is that Wildcat Lake has been artificially connected to the Ouachita River through a channel and may receive flows from the Ouachita River throughout the year. There is also a higher potential for wildlife to migrate into or out of Wildcat Lake from the Ouachita River.

Due to low water levels, Wildcat Lake may be inaccessible by boat. If Wildcat Lake cannot be accessed, Pete Wilson Lake or Grand Marais Lake will be used. Both Pete Wilson Lake and Grand Marais Lake are similar in appearance and inundation from the Ouachita River to Mossy Lake.

1.3.1 Coffee Creek Background – Site 1.

Coffee Creek begins at Lucas Lake which drains stormwater from parts of the City of Crossett. Site 1 drains an upland area, but is not ever under the influence of the Georgia-Pacific effluent. The site location is shown on Figure 4.

1.3.2 Coffee Creek @ Parsons Reference Site – Site 2.

Coffee Creek at Site 2 runs to the west of the Georgia-Pacific effluent canal. This site is approximately at elevation 75 ft NGVD and during extreme floods can be inundated by the Ouachita River. During the reconnaissance conducted on March 31, 2011, this location had puddles of water in various stretches of the stream bed. There was little to no flow between the puddles visible at the surface. The site location is presented in Figure 5.

1.3.3 Indian Creek near Sulfur Springs – Site 3.

Indian Creek is a tributary to Coffee Creek that drains forested wetland and farming areas. It will serve as a reasonably similar drainage basin as the lower part of Coffee Creek. The use of this station will depend on access. The location is presented in Figure 6.

1.3.4 Coffee Creek near the old Railroad Bridge – Site 4.

Coffee Creek at Site 4 runs just west and parallel to the Georgia-Pacific effluent canal. This site is inundated during flooding and waters from Georgia-Pacific could conceivably mix with these waters during flooding events. However, there is a substantial levee (the old railroad raised bed) that lies between the Site 4 and the canal. The site location is shown in Figure 7.

1.3.5 Coffee Creek near the Confluence with the GP Effluent Canal – Site 5.

Site 5 during flooding may be commingled with the Georgia-Pacific effluent. During dry weather flow, the Site 5 location will be an independent stream. Elevation at this site is approximately 65 ft NGVD based on the USGS topographic map. Sampling at this location will depend on access. The site location is shown on Figure 8.

1.3.6 Mossy Lake – Site 6.

Mossy Lake is approximately 584 acres in size. The majority of Mossy Lake is approximately 1 to 2 feet deep and is influenced considerably by flow from Georgia-Pacific's effluent. This location is shown on Figure 9.

1.3.7 Felsenthal Reference Stream – Site 7.

An unnamed, forested wetland tributary located off Pine Island Access Road will be sampled. This tributary is very similar in visual appearance to Coffee Creek. This site location is shown on Figure 10.

1.3.8 Felsenthal Reference Lake– Site 8.

Wildcat Lake in the Felsenthal Wildlife Management Area has been selected as the reference Lake. If Wildcat Lake cannot be accessed, another lake in the Felsenthal Wildlife Management Area will be chosen. The first alternate choice is Pete Wilson Lake. The second alternate choice is Grand Marais. At the entrance to Wildcat Lake from the Ouachita River, the water depth was 3 feet. The Reference tributary is located to the northeast of the boat entrance. Wildcat Lake, Pete Wilson Lake, and Grand Marais Lake are shown on Figure 11.

1.4 Additional Comments.

No samples will be collected on the Ouachita River. This study is to perform a UAA for portions of Coffee Creek upstream of Mossy Lake and Mossy Lake, not for the Ouachita River. The River is not in any way similar to the habitat of Coffee Creek and Mossy Lake during non-flooded stages.

Coffee Creek downstream from Mossy Lake and Outfall SMS-002 will not be sampled. This part of the stream has been under the influence of the Georgia-Pacific discharge since the late 1930's. The sampling upstream of Mossy Lake will be representative of this section of the stream without the influence of the seasonal flooding from the Ouachita River. Resident species in this part of Coffee Creek are reflective of the Ouachita River and not Coffee Creek, as noted in the Parsons study.

SECTION 2

STUDY OUTLINE AND TIMELINE

2.1 STUDY OUTLINE

This UAA study is designed to collect the following data. This is a summary outline. Methodologies and further descriptions are provided in Section 3.

2.1.1 Review Available Historic Data

AquAeTer will review Historic Data of the Coffee Creek-Mossy Lake system. AquAeTer will review historic data that AquAeTer collected in addition to the data collected by Parsons or other entity, including Georgia-Pacific.

2.1.2 Physical Evaluation

The physical evaluation will collect information on flow and habitat descriptions. The habitat descriptions will include information on suspended solids and sedimentation, pools, riffles, substrate composition and embeddedness, bank stability and cover, channel characteristics, velocity, and a riparian evaluation.

2.1.3 Chemical Evaluation

The chemical evaluation will collect information on water quality parameters. Water quality parameters will include dissolved oxygen (DO), pH, fecal coliform, five-day biochemical oxygen demand (BOD₅), nitrate, phosphate, temperature, turbidity, total solids, total suspended solids, total dissolved solids, chloride, sulfate, hardness, alkalinity, and salinity.

In addition to the normal chemical parameters specified by the UAA Guidance documents, additional parameters may be added that are related to the Georgia-Pacific Permit requirements.

2.1.4 Biological Investigations

The biological investigations will collect fisheries data and macroinvertebrate data.

2.1.5 Hydrologic Data

USGS data will be collected daily for Ouachita River elevations for the last 10 years. This will be compared with elevations along the Mossy Lake dike and the Coffee Creek basin.

Mossy Lake dike elevations may need to be surveyed. Coffee Creek elevations will be estimated from USGS topographic maps.

2.2 PROJECTED STUDY TIMELINE

This study is anticipated to be completed in December of 2012. Field events are expected to be completed during summer 2011, fall 2011, spring 2012, and summer 2012. A projected study timeline for the sampling events is as follows:

Summer 2011	Work Plan Completion and Review by ADEQ
Fall 2011	Macrobenthos Sample Event 1
Spring 2012	Macrobenthos Spring Sampling Event 2
Summer 2012	Fisheries Sampling Event 1
Summer 2013	Fisheries Sampling Event 2
Winter 2013	Submittal of UAA to ADEQ

SECTION 3

SCOPE OF WORK

During all field activities, field crews will use discretion. If field crews encounter a situation that risks personal health and safety, including inclement weather, biological hazards, or other risks, field crews will halt sampling activities and evacuate the area. In addition, some portions of the creek or portions of the lakes may be inaccessible. These areas will be noted and bypassed.

During physical, chemical, biological, and hydrological evaluations, field personnel will attempt to re-visit the same location during each field event. If the station is braided, physical, chemical, biological, and hydrological evaluations will be made on each braid.

3.1 HISTORICAL DATA

The UAA requirements have a five year limit on data. Data older than five years may not be used as part of the analysis. Previous studies of these areas are described below. These data will be reviewed and included strictly for comparative purposes.

3.1.1 Parsons Report

Parsons published their report on Coffee Creek and Mossy Lake in 2007, titled *Use Attainability Analysis and Water Quality Assessment of Coffee Creek, Mossy Lake, and the Ouachita River*. Data collections began in July 2005. Although the data will be more than 5 years old, the available data in this report will be utilized as part of the UAA.

3.1.2 AquAeTer Data Collections

AquAeTer has performed a number of studies of Coffee Creek and Mossy Lake. These data were all collected more than five years ago. These data will only be used for comparative purposes.

3.1.3 Georgia-Pacific Data Collections

Georgia-Pacific regularly collects data at Outfall SMS-002 on Mossy Lake. Other relevant data collections pertaining to Coffee Creek and Mossy Lake will be utilized. Data older than 5 years will be used only for comparative purposes.

3.2 PHYSICAL EVALUATION

3.2.1 Velocity Measurements

Velocity measurements will be taken at each of the eight stations. At the stream stations, the velocity measurements will be taken at the downstream end of the station. In the lakes, the field team will evaluate where taking velocity measurements will be most feasible.

Current measurements will be collected using Standard USGS techniques (Buchanan 1976). A minimum of 20 measurements will be made in a transect across the stream/lake. Velocity measurements will be made using either a wading rod or from a boat with a Price AA and sounding reel (or equivalent). For velocity measurements made from a boat, the boat will be secured at each point on the transect prior to measuring the velocity.

At each point along the stream transect, the total depth will be measured, and then the velocity will be measured at 0.8 and 0.2 of depth. If using the pygmy or Price AA meter on the wading rod (or equivalent), and the water depth is less than 2.5 feet, one measurement at 0.6 of depth will be made instead of the 0.8 and 0.2 of depth. If using the Price AA meter on the reel with the bridgeboard (or equivalent), and the total depth is less than three feet, then the velocity will be measured at 0.6 of depth. This is a deviation from the method necessitated by the Price AA setup. The Price AA current meter is fixed to the sounding reel at a distance of one foot above the bottom of the weight. This distance will be accounted for when making the depth measurements.

Once the current meter is suspended at the appropriate depth, the number of revolutions will be recorded in a given time period. Counting will be done for at least 40 seconds or a minimum of three clicks over 40 seconds or more. The typical maximum time is 90 seconds. The current meter makes a click on a set point in the revolution of the meter. Time will be started at the first click, which is the zero point. Every revolution, denoted as a click, past that point will be counted. Both the pygmy current meter and the Price AA current meter are rated for velocities of 0.25 to 8.0 feet per second (ft/sec).

The location of each point on the transect will be marked with a global positioning system (GPS) device capable of sub-meter accuracy. If this is not possible due to canopy cover, equipment malfunction, or other interferences, a tagline will be setup on the transect. The tagline will be used to locate points along the transect.

The full method by the USGS is provided in Appendix A. The distance between each point along the transect will be measured. The total depth at each point will be measured. The depth will be multiplied by the distance from the midpoints between each sample location. This provides a cross-sectional area. This area is then multiplied by the velocity to give a flow rate

through this portion of the stream. This is repeated for each of the points along the transect. The sum of these points provides the total flow in the stream at that transect.

3.2.2 Habitat Descriptions

For each stream station, the habitat will be described. The Rapid Bioassessment Habitat Assessment Field Data Sheet for low gradient streams, located in Appendix B, will be utilized to describe each habitat parameter. Additionally, field crews will create a site sketch of the reach and photograph each station. A log of the photographs will be kept. If the stream reach is braided, each braid will be described.

3.2.2.1 Suspended Solids and Sedimentation

Reaches will be evaluated for sediment deposition in the channel. The reach will be evaluated based on development of point bars and islands and the evaluation of the movement of sediment. The inorganic substrate components will be estimated for percent composition in the sampling reach. Sediment may be collected for size analysis in the laboratory.

3.2.2.2 Pools, Riffles, and Substrate Composition

Stream locations will be evaluated on the mix of pools and riffles in addition to evaluating the mixture and type of substrate materials.

3.2.2.3 Channel Characteristics and Effects of Channelization

Stations will be evaluated based on the appearance of channelization, including embankments or shoring structures, bridge abutments, or dredging. The channel flow will be measured as described in Section 3.2.1.

3.2.2.4 Temperature

Temperature of the stream channel will be measured using a hand-held meter. Additionally, available cover and vegetative protection will be evaluated.

3.2.2.5 Riparian Evaluations

Riparian vegetative zones will be evaluated based on the development of the riparian zone, the bank stability, the amount and type of vegetative protection, and the impact of human activities.

3.3 CHEMICAL EVALUATION

Water quality parameters will be taken at each sample location. If water quality parameters indicate that the lake water column is stratified, a composite sample will be collected from the epilimnion, thermocline, and the hypolimnion. For those areas that are not stratified based on water quality measurements and from all streams, grab samples will be collected from one foot below water surface, except where total water depth is less than two feet. Where the water depth is less than two feet, water samples will be collected at mid-depth in the water column. The following parameters will be sampled, which include:

- DO (% Saturation);
- Fecal coliform density (#/100mL) (Analysis of E. Coli may be substituted);
- pH;
- Specific conductance at 25°C as conductivity;
- BOD (mg/L);
- Nitrate (mg/L);
- Phosphate (mg/L);
- Temperature (°C) departure from equilibrium;
- Turbidity (NTU);
- Total solids (mg/L);
- Total dissolved solids (mg/L);
- Total suspended solids (mg/L);
- Chloride (mg/L); and
- Sulfate (mg/L).

DO, pH, conductivity, and temperature will be measured at fixed locations for at least two days and instantaneously at each station. Salinity will be measured instantaneously at each station. The deployed instruments for the two day readings will be Hach/Hydrolab Mini-Sonde 4a (sonde) multi-probe instruments (or equivalent). The instruments to be used for instantaneous readings are Hach Quanta multi-probe instruments (or equivalent). The sondes will be calibrated prior to deployment and after they are retrieved. The Quantas will be calibrated at the beginning and end of each day.

Turbidity measurements will be made in the field. A Hach turbidity meter (or equivalent) will be used to collect the turbidity readings. The turbidity meter will be calibrated at the beginning and end of each day.

Fecal coliform or E. Coli will be collected for laboratory analysis. It is noted that fecal coliform or E. Coli has a hold time of 6 hours. Depending on the location of the laboratory, it may not be possible to get the sample to the laboratory within the specified hold time. The

Standard Method 9222E Delayed-Incubation Fecal Coliform Procedure may be utilized to increase the hold time of the sample. A field method may be utilized ReadyCult method.

Biological oxygen demand (BOD), nitrate, phosphate, total suspended solids (TSS), hardness, acidity, alkalinity, and total dissolved solids (TDS) will be collected for laboratory analysis. Samples will be collected in accordance with laboratory guidance, packed on wet ice, and sent to a laboratory under chain of custody.

3.4 BIOLOGICAL INVESTIGATIONS

All biological collection will be performed under the Arkansas Fish Collection Guidance in Wadeable Streams and Lake Standard Sampling Procedures, the Arkansas Macroinvertebrate Standard Operating Procedures April 2010, and the Rapid Bioassessment Protocol (Barbour et al., 1999). These documents will be used as guidance. Fish and macroinvertebrates collected will be reported in an annual report to the state, in accordance with requirements in the Arkansas Game and Fish Commission Scientific Collection Permit. If field conditions require any modifications to the work plan, it will be noted in the field notebook.

3.4.1 Fish Sampling

3.4.1.1 Stream Collection Procedures

Streams will be sampled using a Smith-Root model 15-B backpack electrofishing device or equivalent. Samples will be collected from all available habitats for two concurrent summers. Field teams will consist of three workers: one to operate probes or carry backpacks; one to net stunned fish; and one to carry a bucket for stunned fish and document the fish sampling activities. Reaches of 250 to 500 meters will be sampled from downstream to upstream. In riffles, two workers can position a twenty-foot seine at the toe of the riffle while the other worker will electrofish and disturb the substrate; this will allow stunned fish to drift downstream into the net. A GPS will be used to mark sampling location and a map of widths and lengths of the stream will be drawn. If canopy cover prevents GPS readings, approximate locations on a USGS topographic map will be marked. Field data sheets will be completed for each site. These data sheets will include water quality measurements, a habitat assessment, and a description of the fish collected. These sheets are included in Appendix B.

Reaches will be electrofished until the field team leader determines that all meso- (i.e. pool, riffle, run) and microhabitats (i.e. pool tails and margins, glides, etc...) have been sufficiently represented in the sample. Fish less than 20 millimeters will not be included in the reporting and will be released. When possible, individuals will be identified to species in the field and released. Remaining individuals will be preserved in 10% formalin and transported to the biology lab for identification. Fish will be identified to the lowest possible taxonomic level.

A representative sample of each species will be collected for QA/QC identification in the laboratory.

3.4.1.2 Lake Collection Procedures

Mossy Lake and Wildcat Lake (or alternate lake) will be sampled for fish using the ADEQ Fisheries Division Standard Sampling Procedures for electrofishing as guidance with the following exception: instead of sampling in the spring or fall, sampling will be conducted during the summer, as per the ADEQ guidance for sampling streams. In addition, the Rapid Bioassessment Protocol will be used as guidance. The habitat assessment field sheets (Appendix B) and fish sampling field sheets (Appendix B) will be attached to any associated field notes.

Electrofishing power should be standardized at each sample site. After measuring water conductivity and temperature, Table 2 within the Arkansas Game and Fish Commission Fisheries Division Standard Sampling Procedures should be used to determine the appropriate power settings, which is included in Appendix C. Electrofishing at these power settings will ensure potential transfer of 3,000 watts from water to fish. Power (watts) is calculated as the volts multiplied by the amps.

Each lake will be considered one sampling section. Field personnel will attempt to electrofish one complete circuit around the perimeter of the lake. If the field team determines that the perimeter of the lake is not feasible to electrofish, 28 potential sample sites will be located throughout the lake prior to field activities. The field team will then randomly select at least 14 of the 28 potential sample sites to electrofish. Each sample site will be electrofished using 10 minutes of actual pedal-down time. Each lake will be electrofished for a total of no less than 140 minutes. If it is determined in the field that a selected site cannot be sampled, the next site, either to the left or the right, will be determined by the flip of a coin.

A GPS will be used to mark sampling location and a map of widths and lengths of the stream will be drawn. Field data sheets will be completed for each site. These data sheets will include water quality measurements, a habitat assessment, and a description of the fish collected. When possible, large individuals will be identified to species in the field and released. Fish less than 20 millimeters will not be included in the reporting and will be released. Remaining individuals will be preserved in 10% formalin and transported to the lab for identification. Fish will be identified to the lowest possible taxonomic level. A representative sample of each species will be collected for QA/QC identification in the laboratory.

3.4.1.3 Sample Storage

Samples will be placed in five gallon buckets filled with ambient water until fish are identified or preserved for collection. Individuals that will be sent to the laboratory for collection

will be preserved in a 10% formalin solution and transported to the laboratory for identification. Samples should loosely fill a jar three fourths (3/4) full or less.

If more than one jar is required for a sample site, jars will be labeled with the following format: ## of ##. The jar will be labeled with tape affixed to the lid of each sample jar. The label will contain the following information:

- Sample site ID
- Location/Stream
- Date and Time
- Collectors' initials
- Sampling Method Used
- ## of ##

Any additional information will be documented in a field notebook with the same information above. The habitat assessment field sheets (Appendix B) and fish sampling field sheets (Appendix B) will be attached to any associated field notes.

3.4.2 Macroinvertebrate Sampling

3.4.2.1 Stream Collection Procedures

Macroinvertebrate sampling will be completed using ADEQ's Standard Operating Procedure for Macroinvertebrate Sampling Methodology for Wadeable Streams (April 2010) and the Rapid Bioassessment Protocol (Barbour et al., 1999) for guidance.

Three sampling methods will be utilized for collecting macroinvertebrates in wadeable streams, contingent upon habitat availability and/or study goals. The five minute traveling kick, systematic transect, and proportional habitat sampling methods are described in this document following general sampling procedures. Sampling will be conducted on a semi-annual (fall and spring) basis. Fall sampling will be conducted sometime from October through early December and spring sampling will be conducted sometime from March through early May.

Sample reaches will be selected to represent local instream characteristics. Preferably, reaches should be at least 100 meters upstream of any road or bridge crossing to minimize effects on velocity, depth, and overall habitat quality. There should be no major tributaries, springs, municipal or industrial discharges directly to the stream in the study reach.

Before macroinvertebrate sampling, physical and chemical characteristics of the reach will be measured. Care will be taken to minimize disturbing the sample reach. If the sampler must walk through the stream, he/she should do so just downstream of the area to be sampled for macroinvertebrates. Characteristics to be measured and recorded include, but are not limited to,

reach length, substrate type, flow, dissolved oxygen, pH, temperature, bank stability, canopy cover and riparian zone composition. A Habitat Assessment Field sheet will be completed for each reach. A map and GPS coordinates will also be completed.

An individual sampling effort will consist of a “kick” or a “jab.” A kick will be performed on substrates such as cobble, pebble, or bedrock within riffle, run, or shallow pool hydraulic units. A jab will be performed in rootwad, detritus, vegetation or deadfall type habitats. A kick is a stationary sampling technique accomplished by positioning the net on the stream bed and disturbing the substrate, 0.5 meters upstream of the net (Barbour et al. 1999). The same amount of effort should be applied to all kicks in order to compare samples on a “catch per unit effort” basis. A jab is a qualitative sampling technique consisting of forcefully jabbing and sweeping a D-frame net into a productive habitat. Each jab should sweep a linear distance of 0.5 meters (Barbour et al. 1999), and the same effort should be applied to each jab. Jabs and kicks should be directed toward the center of the frame so that dislodged organisms are carried into the mouth of the net.

After each kick or jab, the contents of the net will be emptied into a sieve bucket with 500 micron mesh bottom to prevent loss of specimen. This will create a composite sample for the reach. Large debris (rocks, leaves, and sticks) will be brushed and rinsed of any attached organisms and discarded outside of the sample area. Samplers will use caution in order to prevent damaging specimens.

After sampling is complete, the net will be shaken and rinsed with distilled or tap water to dislodge any debris or stray organisms into the sieve bucket. Any remaining visible organisms will be carefully removed from the net with forceps. Remaining debris will be rinsed to remove organisms and discarded.

3.4.2.1.1 Five-Minute Travelling Kick Method

The five-minute traveling kick method will be used when there are ample riffle habitats available for sampling, and research goals do not require that multiple habitats be sampled. This method maximizes the sampler’s ability to collect macroinvertebrates from all micro-habitats available within a riffle. Two riffles will be sampled within the selected reach using the kick collection method. Samples will be collected for both riffles for a combined time of five minutes. All kicks will be combined into one composite sample.

A sample will be collected by starting at a downstream corner of a riffle and kicking the substrate along a diagonal path upstream through the riffle. Depending on the size of the riffle, single or multiple paths may need to be kicked.

Although this method is intended to be a qualitative sampling method, timing of the sampling event allows for the approximation of “catch-per-unit-effort”.

3.4.2.1.2 Systematic Transect Method

The systematic transect method will be used when multiple habitats are to be sampled. A tape measure will be strung along the edge of the selected 50 meter reach while the sampler avoids walking through the sample area. The sampler will begin at the downstream end of the 50 meter reach at a randomly selected starting point: right, middle, or left of the wetted stream bed. The stream can be visually divided into thirds to determine left, center and right. The sampler will then kick or jab, whichever is appropriate, at the first location. Samples will be collected every 5 meters upstream while rotating to the next station to the left.

3.4.2.1.3 Proportional Sampling Method

The proportional sampling method will be used when research goals require that all available habitat types be sampled, or when there are no riffle habitats available within a representative reach (such as in the sample ecoregion, the Gulf Coastal ecoregion). A 100-meter reach will be visually examined and relative proportions of available productive macroinvertebrate habitats will be recorded in the field data book. The sampler will then move upstream collecting a total of 20 jabs or kicks over the length of the reach. Each habitat type will be sampled in proportion to its representation within the reach. For example, if snag habitat makes up 50% of the reach, then 50% of the kicks/jabs (10) will be taken in snag habitats.

3.4.2.1.4 Habitat Selection

Habitat types are to be selected according to their propensity to provide suitable habitat for macroinvertebrates. Habitat types include, but are not limited to:

Haptobenthos habitats:

Snags—Snags are woody debris, such as downed trees, which have been submerged in the stream for an extended period of time (not recent deadfall). Exact sampling strategy is highly dependent on the structure of the snag. Large diameter snags should be scrubbed by hand to remove macroinvertebrates or avoided altogether for more favorable snag habitat if available. The net should be jabbed into limbs and rootwads and swept back and forth in an effort to dislodge and capture freed macroinvertebrates.

Aquatic Vegetation—Aquatic vegetation should be sampled by jabbing and sweeping the net within the vegetation plot. The net should be swept through standing vegetation in deep water. In shallow water, the net should be jabbed and swept through the vegetation making sure to sample the roots but not dig into the substrate.

Vegetated and Undercut Banks—Undercut banks will be sampled in a similar fashion to the aforementioned methods for snags and vegetation. Rootwads will be sampled in a sweeping motion like submerged limbs.

Herpobenthos Habitats:

Gravel/Cobble—Gravel and cobble will be the dominate substrate in riffle and run habitats for most Arkansas ecoregions. Macroinvertebrates inhabit the surfaces of these substrate particles as well as the interstitial spaces between the particles. These habitats will be sampled using the kick method described above.

Bedrock—Bedrock is often slippery and care should be taken to avoid injury when sampling. The kick method is used to sample bedrock.

Sand and Fine Sediments—Caution should be taken when sampling soft substrates to avoid overloading the sample with debris and sediment. The net should be bumped, not dragged, along the bottom to dislodge macroinvertebrates into the water column. The net should be swept back and forth to capture macroinvertebrates dislodged and floating within the water column.

3.4.2.2 Lake Collection Procedures

Mossy Lake and Wildcat Lake (or alternate lake) will be sampled for macroinvertebrates using the ADEQ Fisheries Division Standard Sampling Procedures, Recommended Protocols for Sampling and Analyzing Subtidal Benthic Macroinvertebrate Assemblages in Puget Sound (USEPA 1987) and the Rapid Bioassessment Protocol as guidance. The habitat assessment field sheets (Appendix B) and macroinvertebrate sampling field sheets (Appendix B) will be attached to any associated field notes.

Each lake will have 28 potential sample sites located throughout the lake prior to field activities. The field team will then randomly select at least 14 of the 28 potential sample sites to sample. Each location will use a ponar grab to collect the sample. If no sediment was collected at a station in the first ponar grab, multiple grabs will be taken. If it is determined in the field that a selected site cannot be sampled, the next site, either to the left or the right, will be determined by the flip of a coin.

A GPS will be used to mark sampling location and a map of widths and lengths of the stream will be drawn. Field data sheets will be completed for each site. These data sheets will include water quality measurements, a sediment description, and a description of the macroinvertebrates collected. The ponar grabs will be field screened for live organisms and live organisms are to be collected and placed into sample jars, described below.

3.4.2.3 Sample Storage

Samples will be placed in labeled ½ gallon, plastic wide-mouth jars, filled with 70% denatured ethanol. Samples should loosely fill a jar three fourths (3/4) full or less. There should always be enough room in the jar to have at least 5 cm (2 inches) of free ethanol above the sample. Samples will be stored in a lab for subsampling and identification.

If more than one jar is required for a sample site, jars will be labeled with the following format: ## of ##. The jar will be labeled with tape affixed to the lid of each sample jar. The label will contain the following information:

- Sample site ID
- Location/Stream
- Date and Time
- Collectors' initials
- Sampling Method Used
- ## of ##

Any additional information will be documented in a field notebook with the same information above. The habitat assessment field sheets (Appendix B) and macroinvertebrate sampling field sheets (Appendix B) will be attached to any associated field notes.

If a sample contains a large amount of algae or other material that will decay rapidly, it may be necessary to occasionally drain the liquid from the sample and add fresh ethanol. This will help preserve the morphological integrity of the invertebrates and aid in taxonomic identification.

3.4.2.4 Laboratory Analysis

The ADEQ Standard Operating Procedures for Sampling Macroinvertebrates in Wadeable Streams will be used as guidance for the subsampling procedure used in Laboratory Analysis. The composite sample will be placed in a 500 micron sieve. The sieve will be marked where each grid square will measure 5.08 cm x 5.08 cm. Silt, clay, and fine sand will be gently rinsed from the sample and large debris will be rinsed, inspected for macroinvertebrates, and discarded. Once the composite sample is free of large debris and fine sediment, it will be evenly distributed on the grid, using a low velocity spray nozzle and/or the sampler's hand. Squares will be selected one at a time using a random numbers table or dice. The entire contents of the square will be placed into a sorting pan. The square will be visibly inspected to ensure all organisms are removed. Any organism that spans multiple squares will be considered as in the square that contains its head. If an organism without an easily distinguishable head (such as an Oligochaet) spans multiple squares, it will be considered as in the square that contains the majority of the body.

A dissecting microscope will be used to count the randomly chosen squares until a subsample of 300 organisms (+/- 10%) is obtained. All of the individuals in a square will be counted regardless if the 300 organisms are reached. Organisms must contain a head and enough features to identify it to a reasonable taxonomic level to be counted. Also, organisms cannot be counted if they only contain an empty shell or just skin. Oligochaets can be counted without a head if one terminal end is present

Subsamples will be placed in a 4 oz. jar with 70% ETOH. Each subsample jar will be labeled with a piece of tape on the outside of the top of the lid and a piece of paper inside the jar. Labels will be clearly written, in pencil, with the site number, sample collection date, number of individuals contained within the subsample, initials of the person who collected the sample, subsample date, and subsampler initials. All applicable field forms will be kept with the corresponding jar.

Macroinvertebrates will be identified to the lowest taxonomic level feasibly possible as presented in the table below.

Table 1. Taxonomic Level of Identification

TAXONOMIC LEVEL	GROUPS
Genus	Plecoptera, Ephemeroptera, Odonata, Trichoptera, Megaloptera, Neuroptera, Lepidoptera, Coleoptera, Hemiptera, Diptera (in part),
Tribe	Chironominae
Family	Diptera (in part), Crustacea, Mollusca
Order	Other non-insect groups

Distinct taxa groups for each sample will be placed into one or two dram glass vials filled with 70% ethanol, to 90% capacity, and stored in a partitioned box. Vials will be logged onto the macroinvertebrate identification form that is presented in Appendix D. The vials in the partitioned box will correspond with the order they are labeled on the identification form. The Quality Control procedures will be followed that are outlined in the **AquAeTer** QAPP.

3.4.3 Data Evaluation

3.4.3.1 Habitat Suitability Analysis

Habitat data collected will be analyzed for suitability of the habitat for biological organisms.

3.4.3.2 Diversity and Measures of Community Structure

Fish and macroinvertebrates will be evaluated for diversity and community structure based on the organisms found. Species richness and abundance will be assessed.

3.4.3.3 Recovery Index

The stations will be evaluated for the ecosystem to recover from displacement due to pollutional stress in order to evaluate the potential uses of a water body. The following parameters will be analyzed: existence of nearby epicenters for providing organisms to reinvade a damaged system; transportability or mobility of disseminules; condition of the habitat following pollutional stress; presence of residual toxicants following pollutional stress; chemical-physical environmental quality after pollutional stress; and management or organizational capabilities for control of damaged area.

3.4.3.4 Intolerant Species Analysis

Collected organisms will be analyzed for intolerant and tolerant species. Intolerant species are relatively sensitive to degradation of water quality and other habitat modifications, and their populations decline or disappear under those circumstances before more tolerant organisms are affected.

3.4.3.5 Omnivore-Carnivore Analysis

Streams will be analyzed for the trophic structure of the community to provide insight into its production and consumption dynamics. The percentage of omnivore-carnivores in a system provides insight on the ecosystems overall health.

3.4.3.6 Reference Reach Comparison

The comparison of the stream with a reference reach is to suggest an objective, ecological approach to determine the ecological potential of priority aquatic ecosystems, evaluating and refining standards, prioritizing ecosystems for improvements, and comprehensively evaluating the ecological quality of aquatic ecosystems.

3.5 FIELD DOCUMENTATION

3.5.1 Field Logbook

Field notes shall be maintained in a bound book. Field activities, location of all materials, and field observations will be documented. The field notes shall include at a minimum, the applicable items for the activity to be noted:

GENERAL INFORMATION

1. Date, Start and finish times of the work, Weather Conditions;
2. Name and Signature of Person making Entry;
3. Names of personnel present;

4. PPE worn; and
5. Names of visitors.

ACTIVITY INFORMATION

1. Station name;
2. Purpose of sampling;
3. Activities completed;
4. Approximate date/time of activities;
5. GPS Coordinates; and
6. Deviations from work plan.

A copy of the original field notes will be submitted as part of the final field report.

Information recorded in other site documents, e.g., sampling logs, will not be repeated in logbooks except in summary form to avoid transcription errors. Any corrections to the logbook or this project's other written documentation will be initialed and dated. All corrections will be shown as a single line through the original. The unused bottom portion of each page will be lined-out, initialed and dated.

3.5.2 Field Log Sheets

Data sheets will be provided to assist field teams with data collection and are included in Appendix B. Log sheets will include:

1. Rapid Bioassessment Habitat Assessment Field Data Sheet for low gradient streams;
2. Site sketch forms for habitat descriptions;
3. Water Quality Log Sheet;
4. Macroinvertebrate data collection sheet;
5. Fish data collection sheet;
6. Photo log sheet; and
7. Velocity measurement sheets.

3.5.3 Chain of Custody

A chain of custody form will be filled out and completed for all samples submitted for analyses. This form will be maintained from the time the sample is collected to the time it is submitted to the laboratory. The chain of custody form will include sampler's name(s), sample container type and number, date and time of collection, sample collection location(s), analyses to be performed, dates and signatures of those releasing and receiving the samples, date and time samples were received by the laboratory, and the total number of samples received. The chain of custody becomes a complete record when signed by the laboratory staff at time of receipt of

samples. The completed document with laboratory signatures will be attached to the analytical report and becomes part of the permanent project record.

3.6 REPORT

All collected data will be compiled into a final report for Georgia-Pacific Crossett and ADEQ for determination by the ADEQ if the current designated uses and use variation for Coffee Creek and Mossy Lake are appropriate and if any revisions to the designated use and use variation for these water bodies should be made. This Use and Attainability Analysis will be developed to meet the standards in the ADEQ Continuing Planning Process (January, 2000).

AquAeTer will include copies of all field documentation and the conclusions of the data evaluation in the final report.

SECTION 4

ADDITIONAL ITEMS

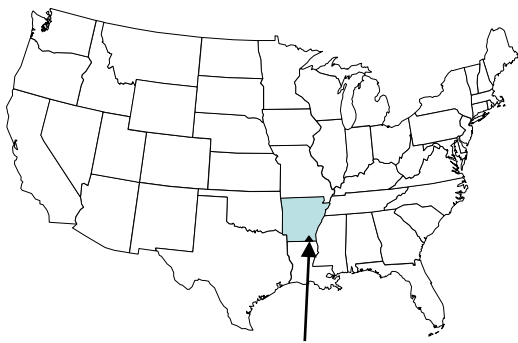
4.1 WATER QUALITY SITE ADJUSTED STANDARD

In addition to the UAA requirements, GP has requested that **AquAeTer** sample the eight site locations for the permit limit requirements which also have a water quality standard, as well as other parameters. **AquAeTer** will collect samples for laboratory analysis for the following parameters:

1. Color;
2. Dieldrin;
3. Copper;
4. Zinc;
5. Total phosphorus;
6. Total suspended solids;
7. Total dissolved solids;
8. Chloride; and
9. Sulfate.

Samples will be collected in accordance with laboratory guidance, packed on wet ice, and sent to the laboratory under chain of custody.

FIGURES



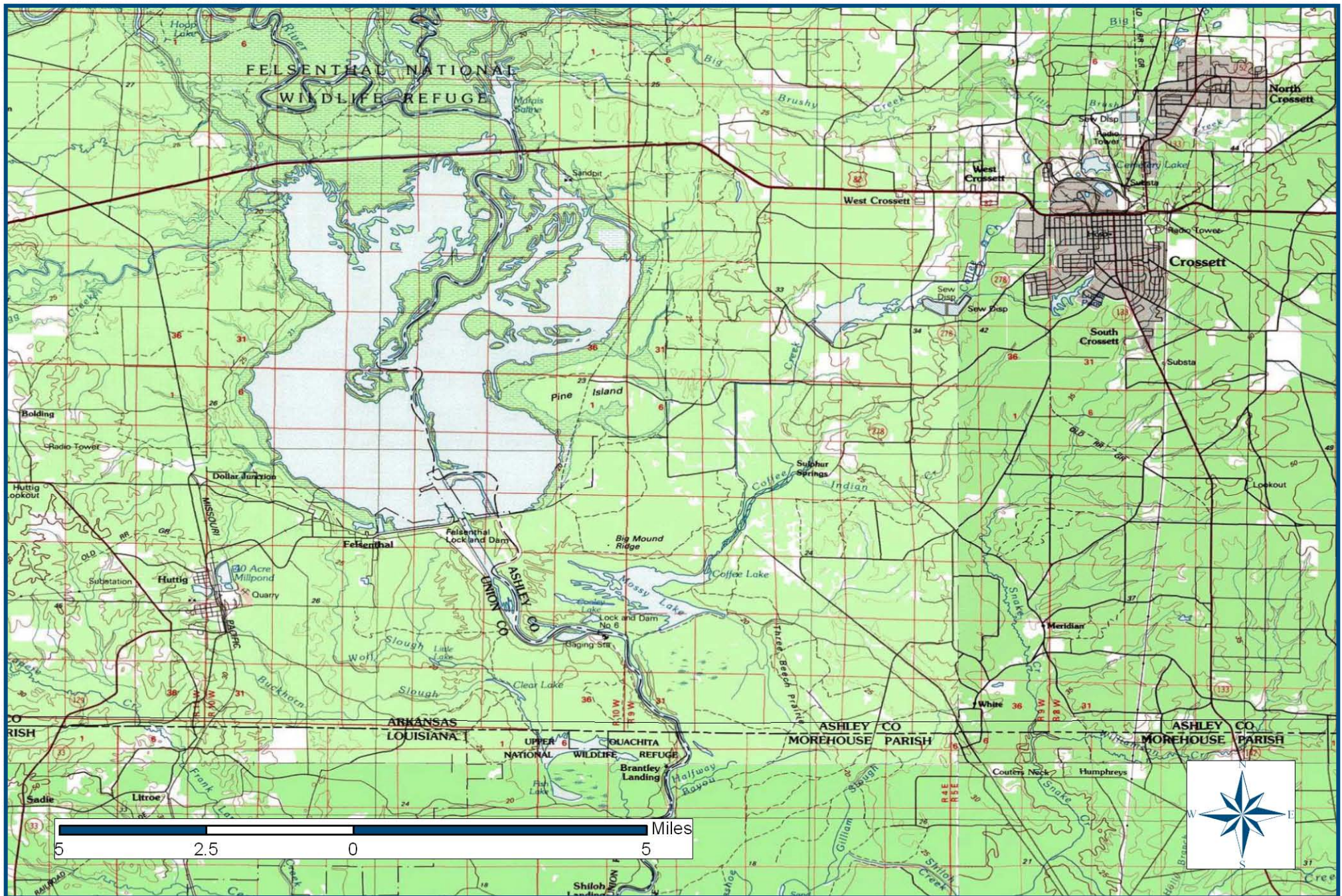
CROSSETT, ARKANSAS



CLIENT: Georgia-Pacific Crossett
LOCATION: Crossett, Arkansas
PROJECT/FILE: 112054

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FIGURE 1
LOCATION MAP



CLIENT: Georgia-Pacific Crossett
 LOCATION: Crossett, Arkansas
 PROJECT/FILE: 112054



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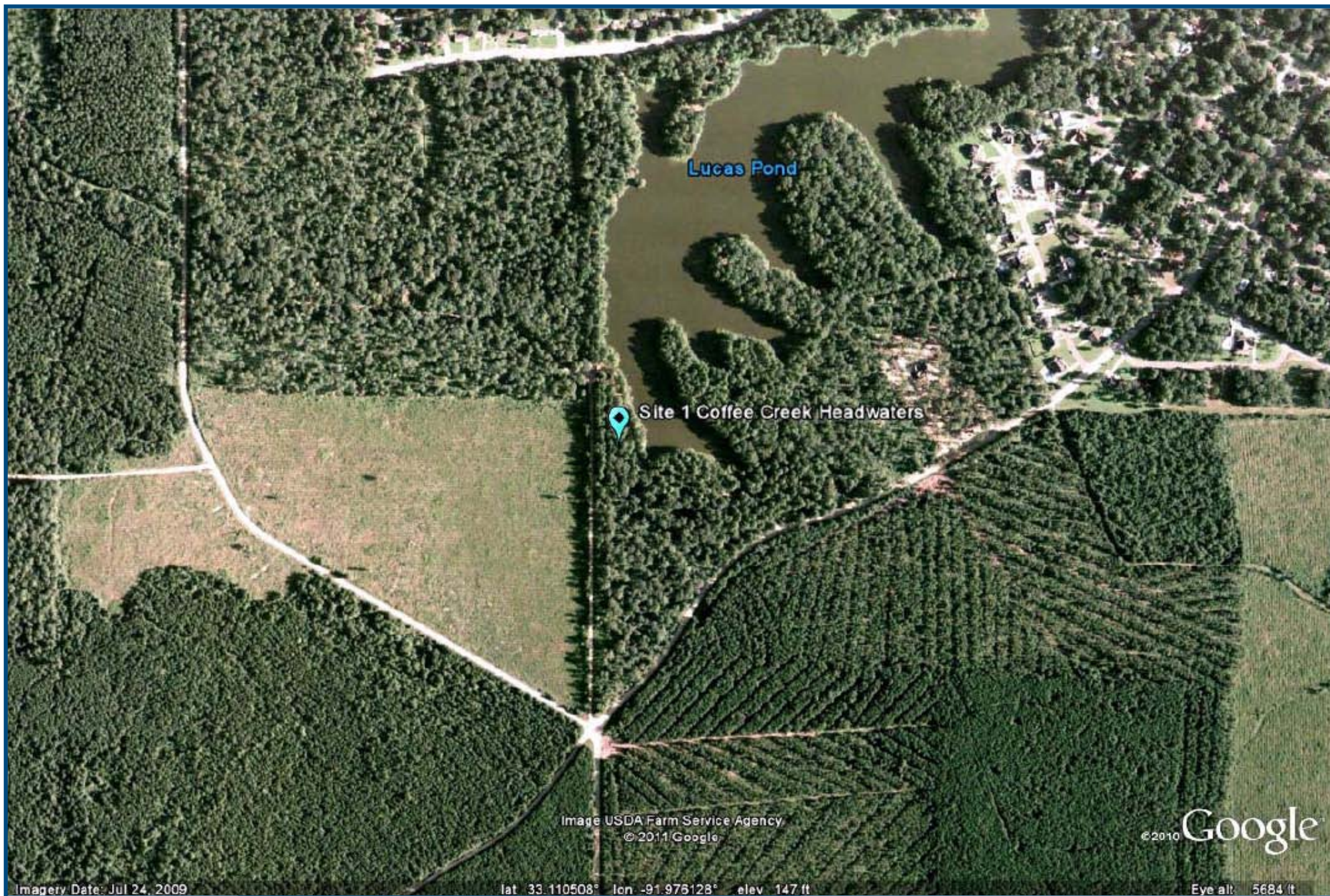
FIGURE 2
AREA MAP



CLIENT: Georgia-Pacific Crossett
 LOCATION: Crossett, Arkansas
 PROJECT/FILE: 112054

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FIGURE 3
APPROXIMATE SAMPLING LOCATION
STATIONS



CLIENT: Georgia-Pacific Crossett
 LOCATION: Crossett, Arkansas
 PROJECT/FILE: 112054

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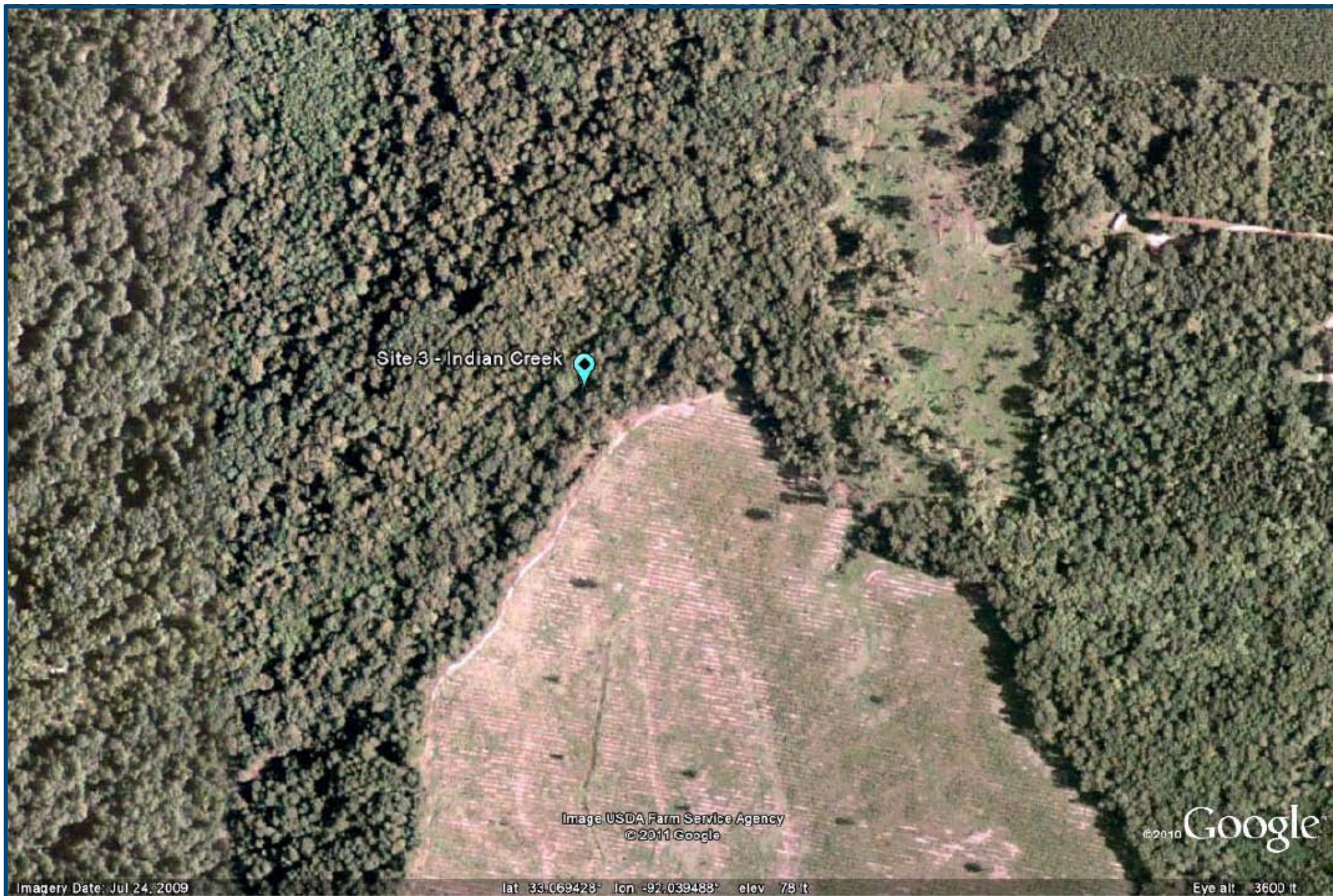
FIGURE 4
APPROXIMATE SAMPLING LOCATION
SITE 1



CLIENT: Georgia-Pacific Crossett
LOCATION: Crossett, Arkansas
PROJECT/FILE: 112054

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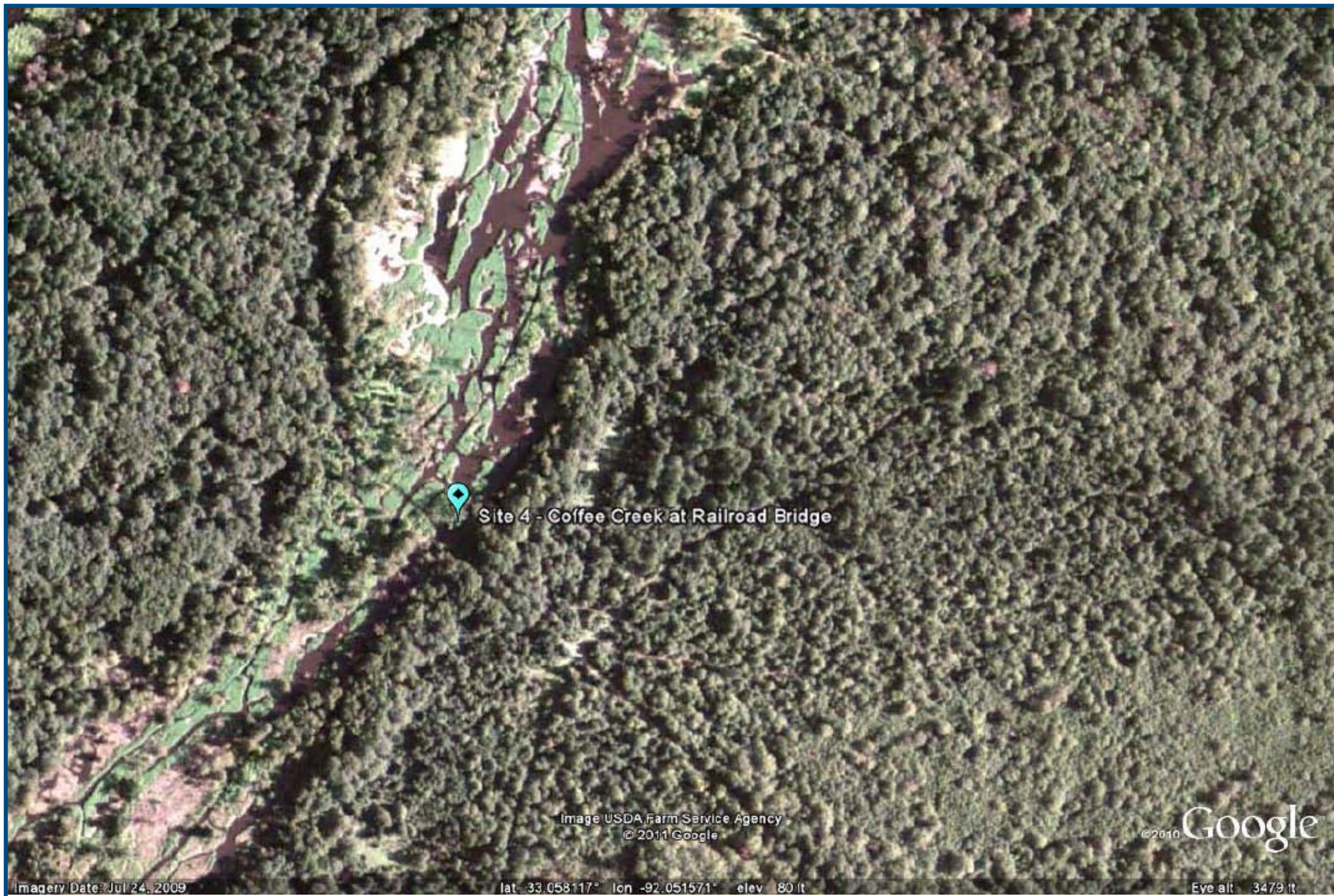
FIGURE 5
APPROXIMATE SAMPLING LOCATION
SITE 2



CLIENT: Georgia-Pacific Crossett
LOCATION: Crossett, Arkansas
PROJECT/FILE: 112054

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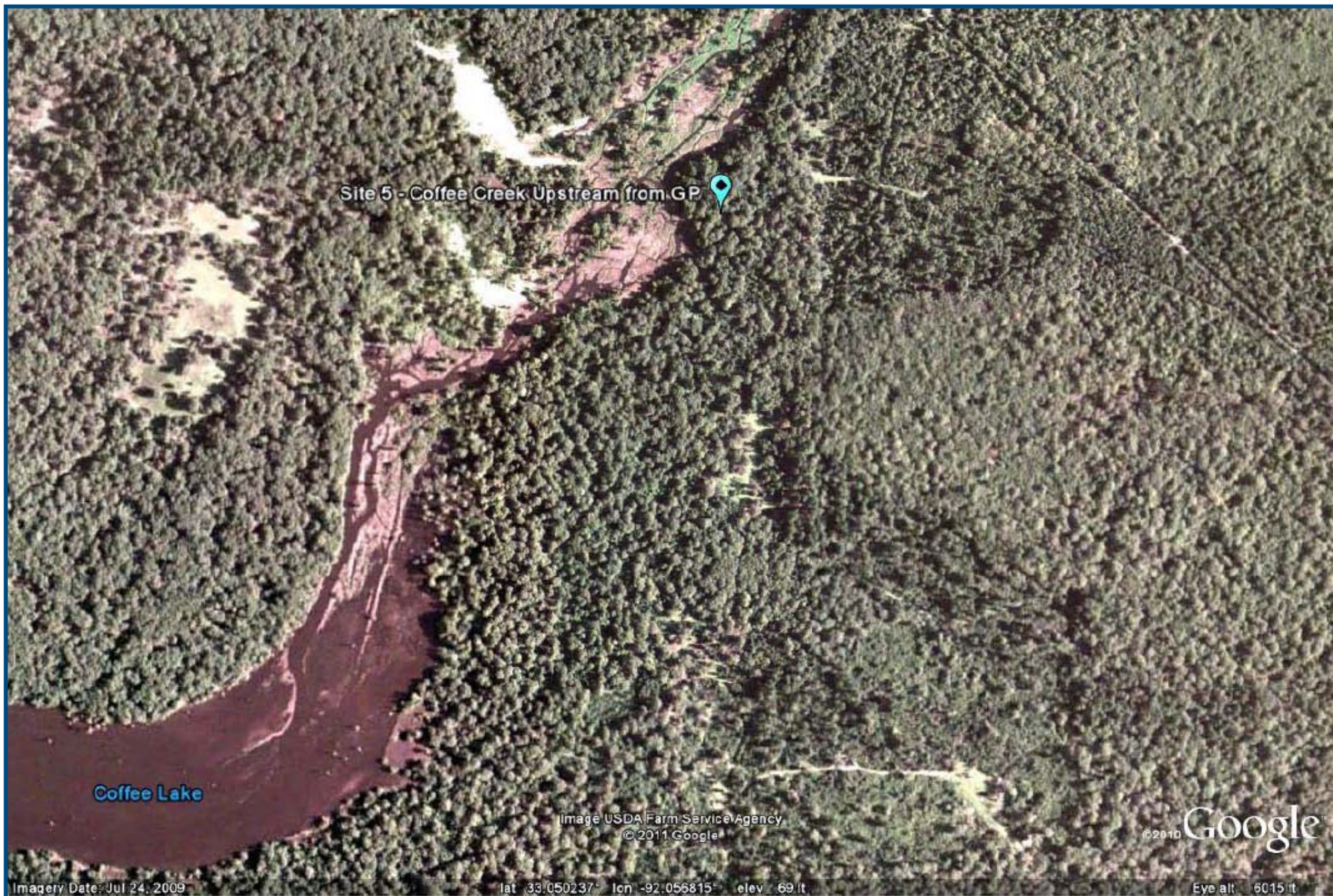
FIGURE 6
APPROXIMATE SAMPLING LOCATION
SITE 3



CLIENT: Georgia-Pacific Crossett
LOCATION: Crossett, Arkansas
PROJECT/FILE: 112054

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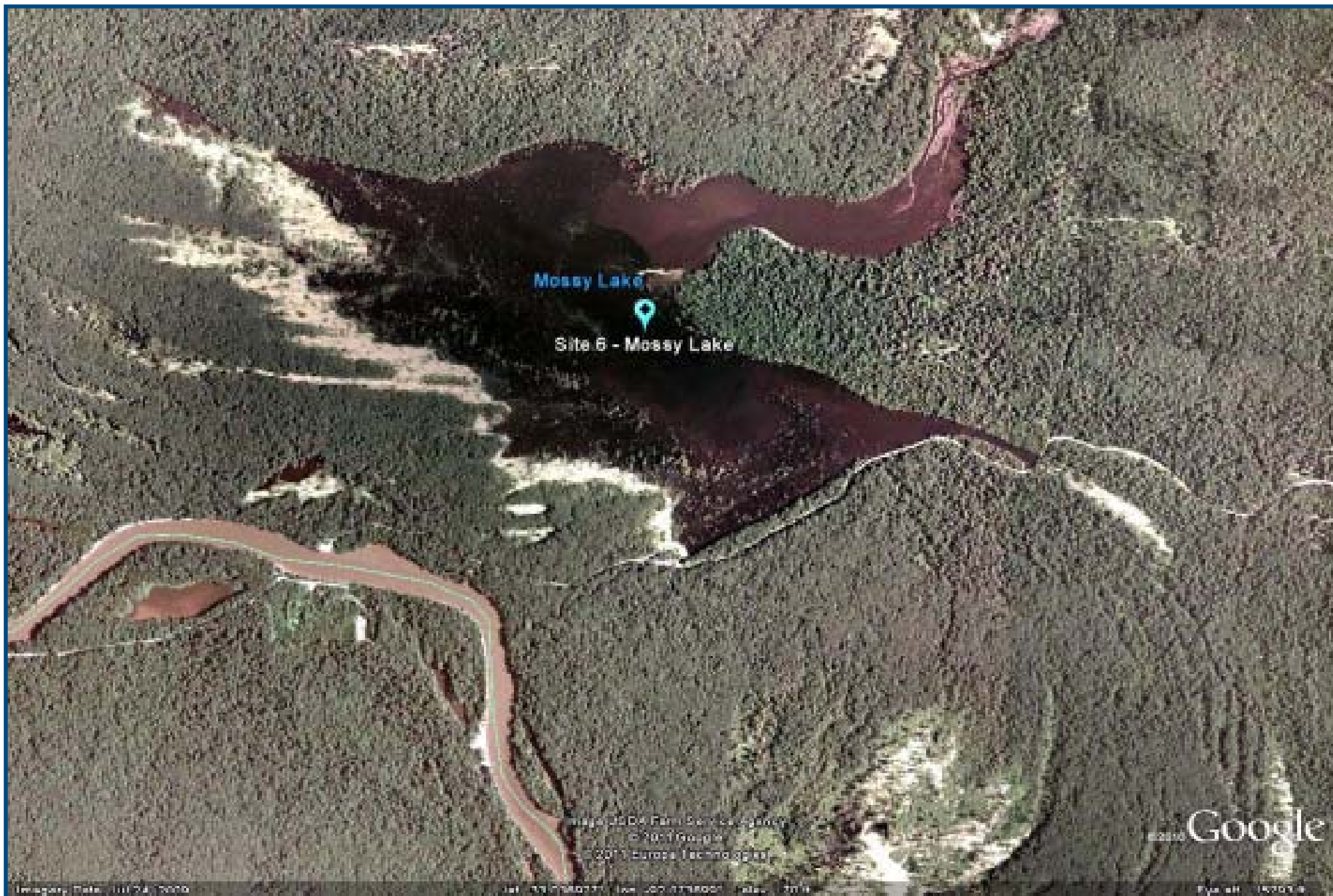
FIGURE 7
APPROXIMATE SAMPLING LOCATION
SITE 4



CLIENT: Georgia-Pacific Crossett
LOCATION: Crossett, Arkansas
PROJECT/FILE: 112054

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FIGURE 8
APPROXIMATE SAMPLING LOCATION
SITE 5



CLIENT: Georgia-Pacific Crossett
LOCATION: Crossett, Arkansas
PROJECT/FILE: 112054

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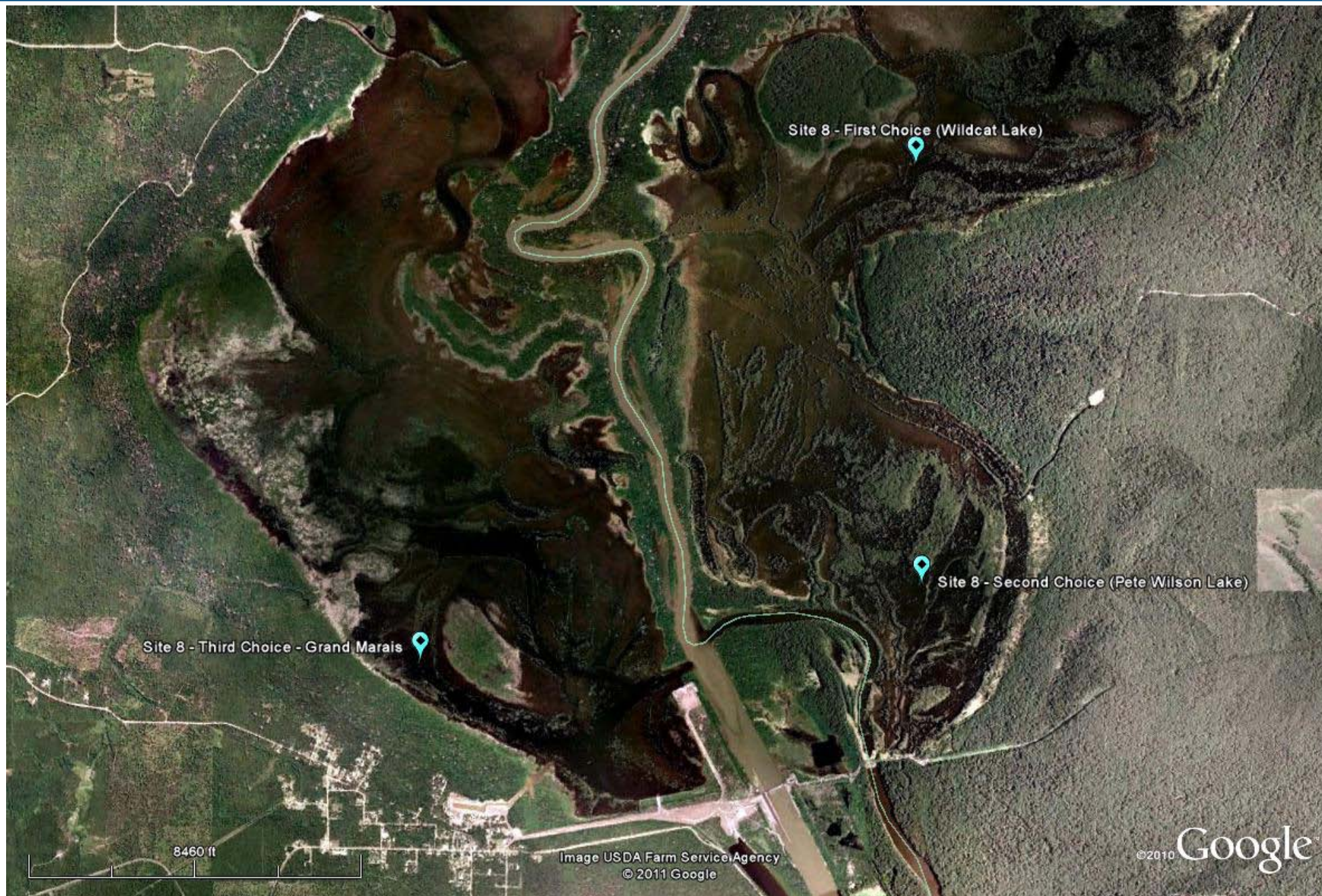
FIGURE 9
APPROXIMATE SAMPLING LOCATION
SITE 6



CLIENT: Georgia-Pacific Crossett
LOCATION: Crossett, Arkansas
PROJECT/FILE: 112054

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FIGURE 10
APPROXIMATE SAMPLING LOCATION
SITE 7



CLIENT: Georgia-Pacific Crossett
LOCATION: Crossett, Arkansas
PROJECT/FILE: 112054

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FIGURE 11
APPROXIMATE SAMPLING LOCATION
WITH ALTERNATE LOCATIONS - SITE 8

APPENDIX A

USGS VELOCITY MEASUREMENT STANDARD TECHNIQUE

APPENDIX B
FIELD DATA SHEETS

APPENDIX C

ARKANSAS GAME AND FISH COMMISSION FISHERIES DIVISION STANDARD SAMPLING PROCEDURES

APPENDIX D

MACROINVERTEBRATE IDENTIFICATION FORM